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THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 327,

For the Week ending April 8, 1882.

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THE STEERING AND PROPELLING GEAR OF THE ALARM.

The report of the Board of United States Naval Engineers, on the Mallory steering and propelling gear as applied to the torpedo boat Alarm, develops results likely to have much influence in determining the conditions of future naval warfare.

The peculiar design and construction of the Alarm have already been described and illustrated in these columns, (SCIENTIFIC AMERICAN, March 17, 1877). The vessel, it will be remembered, is intended as a harbor and coastwise cruising torpedo boat, carrying in the bow one heavy gun and a torpedo spar of special construction. The single gun has no carriage in the ordinary meaning of the term, the vessel as a whole serving as a carriage, while the training of the gun in azimuth is effected by the steering and propelling gear, the boat moving with the gun so as to fight always "bow on."

For this purpose steering gear of great capacity and delicacy was needed, so as to hold the vessel steady while at rest, and to make her movements always prompt and thoroughly controllable, as well when backing as when progressing. The maneuvering qualities desired were first obtained by means of a horizontal feathering wheel, which failed, however, to give the requisite speed without too great a cost in power. Accordingly the propelling and steering gear invented by Colonel Wm. H. Mallory was substituted. The stern of the Alarm was ill-adapted to the use of the Mallory propeller; and such seems to have been to some extent the case also with the machinery used for driving the propeller; still in the opinion of the board of engineers the tests showed the system to be satisfactory in all respects. In their own words, "the results of the experiments show the durability, reliability, and practicability of the Mallory propelling and steering screw, and the efficiency of its application to vessels of at least the size of the Alarm, and its entire appropriateness for all the purposes to which a cruising torpedo boat carrying a heavy gun can be employed."

The Mallory system consists of an ordinary screw propeller combined with actuating mechanism for changing its axis with respect to the axis of the vessel so as to absolutely control the speed and direction of the vessel's motion, while the propelling machinery remains in permanent connection with the screw and unchanged in its movement. The shifting of the axis of the propeller is effected by a pair of auxiliary steam cylinders called steering engines, whose action is controlled by the commanding officer on deck. By means of the steering engines, the screw as a whole, together with its horizontal shaft, can be turned horizontally entirely around the axis of a vertical shaft, on which it is supported either while it is being revolved by the motive engines or when the latter are at rest. When driven by the motive engines it is a propelling screw; moved by the steering engines it is a steering screw; and it may be either or both together at will. The screw as a whole can be turned horizontally around the axis of its vertical supporting shaft with the motive engines either at rest or in motion. Neither the motive engines nor the steering engines are ever disconnected from the screw. The horizontal screw shaft does not extend into the vessel, but is supported in two pillow blocks situated in and forming part of a hollow brass vertical shaft, the lower end of which is made into a journal and held in a lignum vitæ vertical bearing secured on the upper side of the shoe at the stern of the vessel. The upper end extends into the overhanging counter of the vessel, and to it is secured a horizontal worm wheel of phosphor bronze, the lower side of which is supported by and revolves upon the face of a casting firmly bolted to the hull. A wrought iron worm is engaged in this wheel, and the horizontal shaft of the worm is rotated by the steering engines in the usual manner by means of cranks. The steering engines thus rotate the hollow vertical brass shaft and all it contains about its axis. The total weight of the apparatus, with a ten foot propelling screw, was a little overten tons. To obviate certain difficulties developed in steering at high speeds with large powers, Colonel Mallory has invented an improved system, which employs two duplicate screws, having their axes in the same vertical and horizontal planes, but situated on opposite sides of the vertical hollow shaft and revolved in opposite directions by means of a system of beveled gear within the vessel, the power of the motive engines being applied through the gear, instead of through a crank, to the engine shaft. By this improvement the steering is done as easily when turning in one direction as when turning in the other, and with the same power when the motive engines are working at their maximum speed as when they are absolutely at rest.

In summing up the results of the trials the board mention as demonstrated several important advantages to flow from the use of the Mallory apparatus on gun boats. It enables such a vessel of small dimensions to support a gun of the largest size, and to use it with a promptness and precision of aim not otherwise attainable. The vessel can be kept bow on to an enemy when in advance, when at rest, or in retreat; and it can be maneuvered as efficiently when backing as when advancing. The turning power of the screw is unrivaled, and it may be so operated as to apply the entire motive power with the best possible leverage.

The maneuvering of the vessel is entirely in the hands of the commanding officer, who can, by the movement of a handle conveniently placed on deck, direct his vessel as he will, the motive engines always continuing to work at uniform speed in the same direction. "The vessel can thus be steered, stopped, backed, turned completely around on its center of lateral resistance, laid crosswise to its course, and maneuvered in every conceivable manner, all by the power of the motive engines." The importance of this ready and efficient handling of a vessel, especially in the case of torpedo boats, small rams, and gunboats, is beyond question.

The superior capacity of the Mallory propeller is necessarily attained by a considerable increase in complexity and cost of the propelling and steering gear, which must also be somewhat less reliable and durable than simpler mechanism; nevertheless the board are satisfied that its advantages enormously outweigh its disadvantages, certainly for the smaller naval craft. "With this system of propulsion and steering," they say, "the torpedo boat becomes a certain as well as a dreadful factor in naval warfare, and a gunboat of minimum size is able to carry the largest gun and train it in azimuth with a rapidity and accuracy not possible with any separate gun carriages," and the gun's crew may be no more than is necessary for loading and firing. For coast and harbor defense, where no large coal-carrying capacity is required, the heaviest guns may, by this system, be floated upon boats too small to be hit at long range; and when operated with the Mallory gear such boats can be handled with a celerity and precision which must make them formidable antagonists even for the heaviest ironclads.

The failure of the Alarm to make any creditable record for speed is attributed by the board to the exceedingly foul condition of her bottom, which was found to be covered with barnacles a quarter of an inch high, and overgrown in spots with sea grass four or five inches long.

VIRCHOW ON SOUPS AND BROTHS.

This distinguished German professor and politician has been accused of being the chief opponent of soup. He says that this is not true, for he had merely said that meat broths are neither nutritious nor "substantial." That if all the meat which one uses should be boiled and soup made of it the meat would become for the greater part indigestible, and the soup would not be a substitute for it. Broth, he says, is an article of luxury which only the comparatively well-to-do can afford. A family that can only just make both ends meet should learn to deny themselves this luxury, since they have a similar one in their coffee. A rich man can afford to eat soup; while the sick sometimes must have it.

Ordinary meat broth or bouillon in its pure form can only be recognized as a condiment. By the addition of eggs, flour, fat, and other things it may acquire a certain nourishing and heating value. It is, primarily, only a very dilute aqueous solution of substances that are in part of low value as heat producers, such as gelatine, and in part of the stimulating aromatic parts of the meat. Taken warm it is of nearly the same value as coffee or tea, but is inferior to wine, schnapps, or beer; it only stimulates the nerves. It has one advantage over every other condiment, namely, it contains no poisonous substance, it is incomparably milder, hence much better adapted to feeble persons, and finally it can be very conveniently combined with substances that are actually nutritious, and imparts to them an agreeable and "substantial" taste.

It must be admitted that these stimulants (soup and coffee), because they are stimulants, have more significance than mere condiments. By their stimulating power they awake the slumbering energies. So long as power is left to exert this energy these stimulants are able to vitalize these forces. Hence it produces the impression of being itself strengthening. It has not of itself this power; it can only awaken other forces already present, but cannot create them. A tired organ, a tired laborer, can find new strength in a stimulant because it arouses within him certain powers which would not otherwise have come to his aid. In this lies the secret, and at the same time the beneficial effect, of many stimulants, so that they are, of course, more than mere condiments or flavors, and become, to a certain extent, tools. Used in moderation they can do much good in this direction. But it must not be forgotten that they are not food, and that every energy brought forth by stimulants requires a double influx of substance to replace that consumed, so that it may not result in exhaustion. Condiments can never take the place of nourishing food.

A large portion of our food, it is true, acts at the same time as a condiment, and even as a stimulant. By this is not meant those natural mixtures of nutritive and stimulating substances so frequently found combined in vegetables, nor yet those artificial compounds prepared by skilled cooks, but rather food which has been eaten refreshes and strengthens a person long before the real digestion has been finished. A laborer, who is tired and hungry, has set before him a meal of meat and potatoes, and as soon as his meal is eaten he feels refreshed and ready for work again. Nevertheless it is three or four hours before the meat is dissolved and absorbed into the blood, and even if a portion of the potato starch is converted into sugar or glucose while he is chewing it, it is decidedly the smallest portion. The feeling of strength which the man is sensible of cannot possibly come from the assimilation of his food into the tissues. Its direct effect upon the surface of the organs of digestion and a very slight absorption of the material into the blood exert sufficient stimulus to overcome or relieve the weary condition. It is only on this ground that we can explain why a drink of fresh cool water, a sip of wine or beer, seems to be as invigorating as, or even more so than, a piece of roast beef, although not to be compared with it in permanent effects.

The first invigorating effects that we experience after a meal is either due to the action of the condiment or is the result of those properties of food which place them on the same